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(71) Applicant(s)

Zirkon Druckmaschinen GmbH Leipzig  
(Incorporated in the Federal Republic of Germany)  
Riesaer Strasse 72, 04328 Leipzig,  
Federal Republic of Germany

(72) Inventor(s)

Wolfgang Paul

(74) Agent and/or Address for Service

Dr Walther Wolff & Co  
6 Buckingham Gate, LONDON, SW1E 6JP,  
United Kingdom

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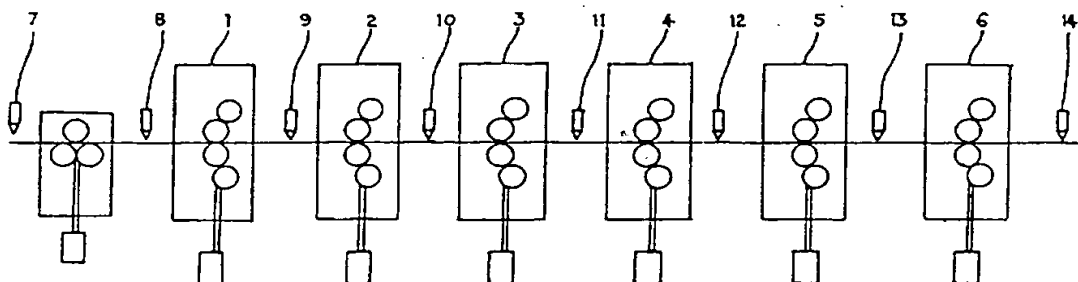
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(54) Abstract Title

**Printing machine with damage prevention system**

(57) A printing machine comprises a series of printing mechanisms (1 to 6) with printing cylinders for printing on a web of paper or other material and a damage prevention system comprising a respective sensor (7 to 14) arranged at each mechanism to detect a tear in the web and control means to cause stopping of the mechanisms in a particular sequence. In the stopping procedure, printing cylinder contact with the web is immediately effected at the first mechanism downstream of the tear and at the or each second mechanism downstream of that first mechanism and the cylinders are then braked. Printing cylinder contact with the web at the remaining mechanisms downstream of the tear is initiated after a delay. The mechanisms upstream of the tear are controlled in synchronism with the mechanisms downstream of the tear.



**FIG. 1**

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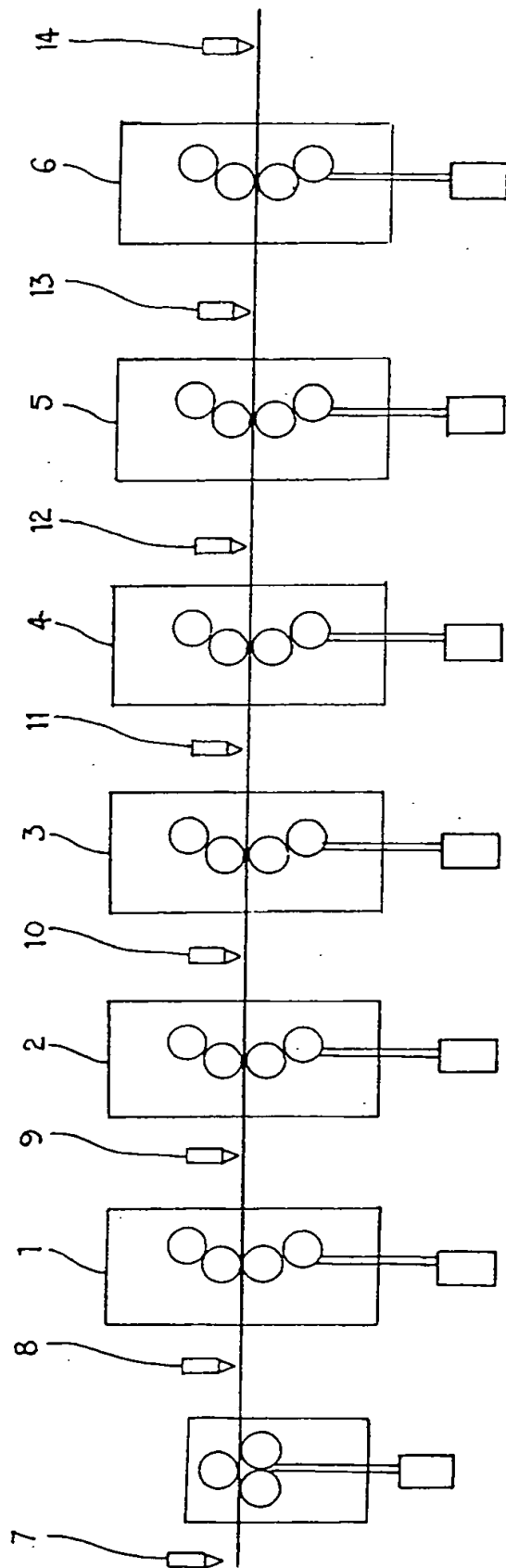


FIG. 1

Web tear sensor	Intake	Printing mechanism 1	Printing mechanism 2	Printing mechanism 3	Printing mechanism 4	Printing mechanism 5	Printing mechanism 6
At the autopaster	X	X	X	X	X	X	X
I	X	X	X	X	X	X	X
II	X	X	X	X	X	X	X
III	X	X	X	X	X	X	X
IV	X	X + $\Delta t$	X	X	X	X	X
V	X	X + $\Delta t$	X	X + $\Delta t$	X	X	X
VI	X	X + $\Delta t$	X	X + $\Delta t$	X	X + $\Delta t$	X
VII	X	X + $\Delta t$	X	X + $\Delta t$	X	X + $\Delta t$	X
All following	X	X + $\Delta t$	X	X + $\Delta t$	X	X + $\Delta t$	X

FIG.2

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PRINTING MACHINE WITH DAMAGE PREVENTION SYSTEM

The present invention relates to a printing machine and has particular reference to a machine which prints on a web of paper, foil, textile or other material and includes a system for the prevention of damage.

In known methods for protection of the printing mechanisms of printing machines against damage in the event of tearing of the web of material to be printed on, the printing mechanisms are usually protected by web-catching, web-cutting or web-wedging equipment.

In the case of DE-PS 41 30 679, there is disclosed a device for the prevention of printing mechanism damage in a rotary roller printing machine, with monitoring equipment for a web of material to be printed on. In this equipment, a respective electrical pulse transmitter, which is integrated into a web guide roller driven by the web and arranged in the last printing unit before one of the printing units and in the first after the same, is provided for ascertaining the printing speed of the respective web guide roller. The pulse transmitters are, for comparison of their pulse values, connected with a computing and control unit which, in the case of a deviation of the difference of the compared pulse values from a preset target value, stops the machine operation.

In this system, a reduction in the speed of response for the prevention of printing mechanism damage is achieved. However, the high technical complexity and space requirement and the disadvantageous printshop operation, since an optimum placeability for all web guiding variants is not possible, are problems with this system. This problem is particularly evident in the case of machines with several webs. Moreover, there is the risk of "web winders" in the case of a web tear. This can lead to the destruction of the cylinder rubber blankets, bearings and spigots or, in the extreme case, to destruction of the complete working system of the printing mechanisms. A production stoppage of up to one week can arise through a "stopper" in the folding mechanism or a "cylinder winder", which damages the machine drive. In practice, this means a degree of utilisation lower by two percent. In addition, there are the costs of repair.

In other known cylinder protection systems, the mechanical drive transmission is interrupted directly in the printing mechanism drive by way of shear pins. For this purpose,

a drive wheel at the rubber blanket cylinder is composed of two parts connected together by way of two shear pins. In the case of overloading of the drive by a "winder", these pins shear off and the drive wheel spins idly on the basic body. A destruction of the cylinder drive and a twisting of the cylinder spigot are thereby avoided.

There remains a need for a damage prevention system by which a checking of portions of a web of material, which is being printed on, can be undertaken after a web tear has taken place.

According to the present invention there is provided equipment for the prevention of technical damage at a printing machine, characterised in that a web tear sensor monitoring the paper web is arranged at each printing mechanism, a control unit which separates the cylinder, that is printing, directly from contact with the web of material to be printed on is associated with the respective cylinder of the first and each further second printing mechanism behind the location of the web tear, a control unit producing a generative braking of the first and each further second cylinder with delay within the printing mechanisms following the location of the web tear is associated with the respective cylinder of the first and each further second printing mechanism behind the location of the web tear, a control unit separating - delayed by a preset time - {the cylinders, that are printing, from contact with the web of material to be printed on is associated in the remaining printing mechanisms arranged behind the location of the web tear and between the afore-mentioned printing mechanisms behind the web tear and a further control unit controls the printing mechanisms before the location of the web tear synchronously in angle, speed and position with the following, individually driven units driven to "zero" rotational speed. }

An embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side elevation of a printing machine embodying the present invention; and

Fig. 2 is a table illustrating actions undertaken at printing mechanisms of the machine of Fig. 1 in the event of a web tear.

Referring now to the drawings there is shown in Fig. 1 a printing machine comprising a series of printing mechanisms 1 to 6 each with a printing cylinder, and associated other cylinders, for printing on a web of paper or other material and a respective web tear sensor 7 to 14 associated with each of the printing mechanisms 1 to 6. A web tear causes a signal to be transmitted to the machine control (not shown) by the sensor detecting the web tear. A braking process of the machine is initiated by the machine control according to a preset stopping algorithm. Thus, in the case of a web tear before the first printing mechanism 1, "zero" rotational speed is controlled towards at the first, third, fifth, seventh and the or each second further printing mechanism and an electromagnetic holding brake is triggered. {The braking operation at the second, fourth, sixth and each further second printing mechanism is initiated by the control after a fixed time, i.e. the electromagnetic holding brake responds later in these printing mechanisms after a fixed delay time. Due to the braking command being initiated at different times between two successive printing mechanisms, an extremely high increase in web tension arises, which leads to a web tear.

{The printing mechanisms before the primary web tear in the direction of running of the web are controlled down to zero rotational speed at the standard brake ramp synchronously in angle, speed and position with the following, individually driven mechanisms. It is thereby achieved that these mechanisms are brought to standstill with little wear and the web remains, to a large extent, in the machine in order to optimise renewed starting of the machine by personnel and to shorten the standstill time. The web portions that have arisen after the primary web tear no longer endanger the printing mechanisms during the braking operation subsequently initiated. {The braking ramp is determined predominantly according to machine type by the maximum speed and the mass inertia moments, which are to be braked, of the mechanisms. For protection against double rubber blanket "winders" by the drawn-back web during a web tear before the printing mechanisms in the direction of an associated folder, only one web capping unit is arranged at the outlet of the last printing mechanism. This capping unit is triggered by the web tear sensor 14 and all further following sensors in the running direction of the paper. After standstill of the machine is attained, the web material, for example paper, residues can be readily removed from the printing mechanisms. A new length of web can be threaded in from the intake through the printing mechanisms up to the position at which the old length of web has remained and can be glued thereto.



Fig. 2 is a table illustrating the sequence of actions undertaken at the machine intake and successive printing units 1 to 6 by reference to web tear sensors located at an autopaster and at subsequent positions (here designated I to VII et seq.).

CLAIMS

1. A printing machine comprising a series of printing mechanisms with printing cylinders for printing on a web of material and a damage prevention system which comprises a respective sensor arranged at each mechanism to detect a web tear and printing mechanism control means responsive to detection of a web tear to directly release printing cylinder contact with the web at the first mechanism downstream of the detected tear and at the or each second mechanism downstream of that first mechanism, to brake the printing cylinders of said first and second mechanisms after a delay, to release printing cylinder contact with the web at the remaining mechanisms downstream of the detected tear after a predetermined delay and to control the mechanisms upstream of the detected tear synchronously in speed and position with those downstream of the tear.
2. A printing machine substantially as hereinbefore described with reference to the accompanying drawings.